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14. ABSTRACT
Flies serve as vectors for many diseases that pose a serious threat to the safety and well-being of deployed military personnel. Filth flies are a major problem anytime there is a military action, because commonly there is an absence or disruption of sanitary systems and governmental services. Our research project targets the development of new insecticide modes of action with traditional concepts of application. It should be possible to treat insecticide-impregnated cords with ultraviolet light reflective dyes and insecticides. These cords could be employed near troops to kill flies quickly. Also, baits do not need to be formulated as scatter baits; they can be formulated as bait-treated surfaces. These baited surfaces could be activated by peeling off protective coverings and be hung in areas where flies occur. Because the number of different insecticides and mechanisms for their use in military conditions remains very limited, more options are needed for effective vector control programs, and we are working with industry to develop these improved control technologies.

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INTRODUCTION

Flies serve as vectors for many diseases that pose a serious threat to the safety and well-being of deployed military personnel. They transmit many enteric diseases including dysentery, cholera, and typhoid fever. Biting flies like sand flies, biting midges, stable flies, horse and deer flies are important vectors of diseases such as anthrax, tularemia, and leishmaniasis. In addition to spreading disease, filth flies like house flies, blow flies, flesh flies, and other Muscoid flies can affect the readiness of troops for military action by reducing efficiency of personnel and affecting morale. In sum, they are a major problem for armed forces deployed for combat.

Combat troops often have to contend with a number of different species of flies. Filth flies are a major problem anytime there is a military action, because commonly there is an absence or disruption of sanitary systems and governmental services. The rapid deployment of troops places stress on the military supply distribution system. Frequent unit movements and other factors make it difficult for fly control supplies to be delivered to the units.

Treatments to control filth flies, that are usually active during daytime, often require military personnel to apply baits or sprays to knock down heavy populations. Biting flies are usually even more mobile than mosquitoes, and present a different problem for troop protection in deployed areas. In both cases, deployed troops need treatments for fly control that minimize or eliminate exposure to insecticides.
Flies also pose a severe risk in deployed hospital environments. House flies, flesh flies and other Muscoid Diptera are known to be attracted to sweat, saliva, blood, and serum. They can land on wounds, lay their eggs, and cause myiasis. As a result, they can easily contaminate field deployed medical facilities and injured troops.

Flies are very difficult to control in situations where troops are being deployed or in mobile combat arenas, and insecticides used to control infestations may harm troops. However, chemical control is still the most important element in an integrated approach to vector control. Three general methods have been used to reduce problems caused by Muscoid flies: preventing breeding, excluding adult flies with screens or other barriers, or killing flies before they can cause harm or reproduce.

Our research project targets the concept of killing adult flies before they can cause harm or reproduce. By merging the developments in insecticides with new modes of action with traditional concepts of delivery using our knowledge of fly behavior, we expect to modify and develop, in conjunction with industry, new technologies of fly control that will successfully solve fly problems for deployed military. For instance, flies prefer to rest on strings and cords and can be controlled using insecticide treated yarn (Hogsette and Ruff 1996). They also are attracted to surfaces that reflect ultraviolet light (Patterson et al. 1980, Patterson and Koehler 1982. Patterson et al 1981). It should be possible to treat insecticide-impregnated cords or yarn with ultraviolet light reflective dyes. These cords or yarns could be employed near troops to kill flies quickly. Also, baits do not need to be formulated as scatter baits; they can be formulated as bait-treated surfaces . These baited surfaces could be activated by peeling off protective coverings and be hung in areas where flies occur. By using new classes of insecticides, insecticide

resistance in fly populations is expected to be overcome. New fly control technologies will provide better protection than products and technologies currently used by the military to suppress flies when deploying troops. Because the number of different insecticides and mechanisms for their use in military conditions remains very limited, more options are needed for effective vector control programs.

YEAR 1 (2004-2005) RESEARCH ACCOMPLISHMENTS

- Hired the following graduate student assistants to study flies and insecticides:
  Matt Aubuchon, Ph.D. candidate
  Lt. Ricky Vazquez (U.S. Army Reserves), Ph.D. candidate
  Alexandra Chaskopoulou, M.S. candidate
  Ryan Welch, M.S. candidate
  HM1 Jeff Hertz (U.S. Navy), M.S.candidate
  Kim Fererro, M.S. candidate

- Enlisted assistance of Dr. David Williams (USDA-ARS retired research leader and courtesy University of Florida faculty member) as a research advisor

- Facilities were established for rearing flies at the University of Florida. Determined USDA-reared flies were more susceptible to insecticides than field strains. Established a field strain of house flies and mass produced it for testing. Initiated research on ammonia production and its toxicity to fly larvae to improve rearing.

- Facilities for testing insecticides on flies were built or acquired. Screened cages were purchased and set up for outdoor testing of insecticide formulations. A wind tunnel was acquired for testing toxicity of contact insecticides. University of Florida agreed to build a room to house the wind tunnel.

- Requests were disseminated for insecticides, insecticide formulations, and technologies among industry contacts. Testing was initiated on submitted products. Compounds submitted were Neonicotinoids, Pyrethriods, Phenylpyrazoles, Oxadiazines, and Organophosphates.

- Primary bait toxicity and attractant testing was initiated. Water/sugar based insecticide treatments were developed using 3 assays: (a) Petri dish, (b) small cage, and (c) field cage. Initiated research on trap configurations and attractants.

- Primary residual surface testing was initiated. Dose-dependent mortalities of house flies to insecticide residues were determined. Evaluation of pyrethriod/neonictotinoid combinations was conducted. Initiated research on insecticide residues on fly cords with new graduate student (military person) who will develop techniques for determining preference of flies for color/gauge of yarn and also develop method for evaluating dose-dependent mortality of flies exposed to treated fly cord.

- Contact toxicity testing will be initiated as soon as the wind tunnel building is completed.

The following are Year 1 research accomplishments covered in detail:

1) Students

Matt Aubuchon, Ph.D. candidate. Working on attractance of flies to light. Light traps are the major technique used in military mess facilities to reduce numbers of flies in food handling, serving, and eating areas. His work will develop procedures for using light traps more effectively.

Lt. Ricky Vazquez (U. S. Army Reserves), Ph.D. candidate, currently deployed. His work is on residual insecticide testing. He is developing dose-response curves for insecticides submitted by manufacturers. He is determining effective insecticides concentrations applied to surfaces and oral toxicities of insecticides for use in baits. He is currently in the Middle East evaluating some of the new insecticides and technologies with deployed forces.

Alexandra Chaskopoulou, M.S. candidate. She will be evaluating aerosol applications of insecticides on flies and mosquitoes. Her work will be primarily using a wind tunnel to atomize the insecticide formulations for direct application to test insects.

Ryan Welch, M.S. candidate. He is working primarily on an evaluation of fly attractants utilizing fly traps.

HM1 Jeff Hertz (USN), M.S. candidate. His work will be to evaluate toxicants applied to fly cords. His initial studies with the fly cords using new insecticides have demonstrated flies can be controlled in military tents overseas. He has 10 years of experience as a Navy Hospital Corpsman and will be very helpful in developing relevant control strategies.

Kim Fererro, M.S. candidate. Ammonia is produced as the nitrogenous waste product of fly larvae. It is produced in copious quantities wherever flies are reared. She will be quantifying ammonia production in various species of flies and determining toxicities of ammonia to larvae.

2) Rearing

Fly rearing was established in the Medical & Veterinary Entomology laboratory at the University of Florida. These colonies originated from the strain provided by the USDA-ARS-CMAVE, Gainesville, FL. The USDA strain dates back to the 1950's. In early pilot bioassays with this strain, it was noticed that the flies were lethargic in their movements. The flies did fly or move around in the trials appearing to lack energy indicating that something was wrong with their genetic fitness.

As a result, a wild strain of house flies (HTU strain) was collected, adapted to laboratory rearing procedures, and mass produced for testing. Flies were field-collected at the horse training unit at the University of Florida. Each horse stall had from 300-600 flies flying just above the horse manure. In addition to collecting flies from this location, collections were also made from the feed storage area which had heavy densities of flies. The flies were held in the laboratory with oviposition medium, and F_1 eggs obtained from this wild strain were sterilized by using similar procedures used to sterilize fly maggots used in medical procedures.

Initially, the HTU strain deposited few eggs in the rearing medium. Eventually after about 3 generations, flies that successfully oviposited dominated and egg production increased. Dr. Chris Geden at USDA-ARS-CMAVE proposed a new rearing medium

that provided a different protein source for the immature stages. Fly production successfully stabilized with laboratory adapted flies reared on the new larval diet. The HTU flies were more active than the USDA strain, and they were less susceptible to insecticides. The HTU has proven to be better adapted for behavioral and insecticide testing than the USDA strains of flies.

A. Quantification of Ammonia Produced by the house-fly, *Musca domestica*

Members of the order Diptera have traditionally been among the most important disease-carrying and nuisance arthropods to human populations. Their control and containment as an urban pest, as well as their usefulness as an indicator of time of death (TOD) in forensic scenarios of both an urban and an agricultural nature, are topics that have received much attention in recent years.

The chemical trails left by insects are extraordinarily useful tools in determining timing of insect development. To date, no definitive study on the levels of excrement produced by forensically important fly larvae (maggots) has been implemented. Using a modified setup taken from William Kern's 1993 Ph.D. dissertation research at the University of Florida which focused on cat flea larvae, we hope to quantify ammonia produced by larval members of the group Cyclorrhapha (Diptera: higher flies) that are of medical and forensic importance in urban settings. We hope to determine the amount by body weight of ammonia produced by maggots in each instar, as well as the critical toxicity (if any) at which maggot masses leave a rearing site. From these data, better designs for fly lures and traps implementing ammonia could be designed. Furthermore,

time of death for animals and humans could potentially be estimated by utilizing the concentration of volatilized ammonia adjacent to a corpse.

Currently, we are in the process of rearing HTU strain *M. domestica* larvae in an enclosed system on the Gainesville housefly diet. Ammonia produced by the larvae will be drawn out of the rearing container via a vacuum pump and into a buffer solution where an ion-specific electrode records the concentration of ammonia in solution. To account for ammonia produced by bacteria growing in the rearing medium and required for optimal larval nutrition, a second (identical) setup will be run sans larva, and the ammonia produced solely by the microorganisms in the medium recorded.

3) Facilities for testing insecticides

The primary testing facility for insecticides is the Urban Entomology Laboratory at the University of Florida. The facility was originally built to house the two principal investigators on this grant (Dr. Koehler and Dr. Patterson). In addition it has the capability of housing 6 graduate students in urban pest management. To house the additional students required for this project, a building addition was added using state funds. The addition will allow the housing of the additional five students brought to the University of Florida by this project.

For field testing of insecticides, 6 screened cages were constructed. The cages measure 6 feet high, 12 feet long, by 10 feet wide. Known numbers of laboratory reared flies can be released into the cages. The effect of residual pesticide treatments, fly bait placements, and fly cord treatments can be evaluated on populations of house flies in confined field situations. The cages are now fully operational for experimental use.

A wind tunnel designed and built by Dr. Gene Gerberg was acquired on indefinite loan from Florida A&M University's John A. Mulrennan Laboratory in Panama City, Florida. The wind tunnel was originally to be placed at the USDA- CMAVE facility in Gainesville Florida. However, there were many difficulties with this plan. The primary difficulty was the potential of pesticide contamination of facilities. As a result, the University of Florida agreed to include a wind tunnel room in the building expansion for the Urban Entomology building. That construction is on-going and is expected to be complete in December of 2005. Due to the problems of wind tunnel location, the contact toxicity testing of insecticides on flies has been delayed.

4) Industry contacts

Manufacturers were contacted and informed that insecticides and devices for fly control could be evaluated in our facility as a result of this grant. The following manufacturers were contacted:

B&G Equipment

BASF Corp.

Bayer Environmental Science

Bell Laboratories

Lineguard Corp.

Curtis Dynafog

Dow AgroSciences

Dupont Professional Products

Farnam Pest Control

FMC Specialty Products

McLaughlin Gormley King Corp.

Nisus Corp.

Pest West

Syngenta Professional Products

Waterbury Companies

Wellmark/Zoecon International

Whitmire Micro-gen

5) Bait and Attractant testing

A. Development of Attractants and Traps

Materials and Methods

Insects. Adult flies were aspirated from screen cages with a modified hand-held vacuum. Aspirated flies were placed into a freezer (-30° C) until inactive (~1-5 min). After removal from the freezer, the flies were placed on a chilled aluminum tray. Flies were counted and sexed (25 males, 25 females) and held in a deli cup (236.58 ml) until release.

Traps. Traps used were categorized as bottom-entry or top-entry. Bottom-entry traps were fitted with an inverted funnel leading into a collection container. Bottom-entry traps included Trap n` Toss™ (Farnam Companies, Inc., Phoenix, AZ), The Advantage Fly Trap™ (Advantage Traps, Inc., Columbia, SC), BC 1752 Dome (McPhail) Trap (Agrisence™ Agriculture, Pontypridd, UK), and box trap (Spalding Laboratories, Arroyo Grande, CA). Their respective ratio entrance:exit areas (cm^2) were 176.24:11.95, 46.57:9.08, 58.77:10.93, and 49:1.44.

Top-entry traps were containers fitted with entrance(s) on the lid. Rescue!® Reusable Fly Trap (Sterling International, Inc., Liberty Lake, WA) and Victor Fly Magnet® Trap (Woodstream, Lititz, PA) each had four entrance holes, and Fly Terminator® Pro (Farnam Companies, Inc., Phoenix, AZ) had one entrance hole. Their respective ratios of entrance:exit areas (cm2) were 0.79:0.50 (per hole), 1.54:0.75 (per hole), and 20.51:20.51.

Bioassay. A fly attractant mixture consisting of 5 g yeast, 0.12 g ammonium carbonate, and 75 ml of water was placed into each trap immediately after mixing.

A cotton-filled plastic cup (88.72 ml) soaked with 50 ml of 10% aqueous sugar solution was placed in release cage (28.8 by 26.1 by 39.1 cm high). Flies were released from deli cup into release cage. The stocking net opening of the release cage was made continuous with the opening of the trap. The stocking net was used to cover the whole trap to prevent flies from escaping.

After 24 h, each trap was removed from the release cage, placed into a sealable plastic bag, then refrigerated at 3 degrees C for ~ 24 h. Upon removal from the refrigerator, captured flies were collected by pouring the attractant mixture through a colander, placed on a chilled aluminum tray, counted, and sexed.

Data Analysis. A student's t-test was run on the means of the bottom-entry and top-entry traps in SAS 8.01 (SAS Institute 2002).

Data for trap catch were arcsine square root transformed and analyzed using one-way analysis of variance, with catch as the response variable and trap type as the main effect. Means were separated using a Student Newman-Keuls test. Data were presented,

however, as mean percent catch ± SE. Significant differences were determined at the P – 0.05 level. Statistical analysis was completed with SAS 8.01 (SAS Institute 2002).

Table 1. Percentage of flies caught in traps

	Mean % Catch $\pm$ SE		
Trap	Males	Females	Total
Trap n' Toss™	38.22 $\pm$ 5.21ab	66.22 $\pm$ 5.89a	52.22 $\pm$ 5.13a
Advantage	51.43 $\pm$ 7.33a	35.43 $\pm$ 6.32b	43.71 $\pm$ 4.40ab
BC 1752 Dome	22.86 $\pm$ 4.07ab	34.86 $\pm$ 6.97b	28.86 $\pm$ 5.03ab
Rescue!®	36.00 $\pm$ 9.38ab	58.40 $\pm$ 12.24ab	47.20 $\pm$ 9.73ab
Fly Magnet®	24.80 $\pm$ 5.57ab	32.80 $\pm$ 7.31b	28.80 $\pm$ 6.09ab
Terminator® Pro	22.00 $\pm$ 13.71b	28.00 $\pm$ 5.42b	25.00 $\pm$ 8.10b

Means within a column followed by the same letter are not significantly different [P = 0.05; Student Newman-Keuls test (SAS Institute, 2001)].

Results

The traps used in this experiment were categorized into bottom-entry and top-entry. There was no significant difference between the two types (student's t-test at P = 0.05). For the total trap catch among all of the traps, only the Trap n' Toss™ and Fly Terminator® Pro were significantly different (Table 1).

There was no significant difference between males and females per trap. There was however, a significant interaction between trap and sex. The Advantage Fly Trap™ caught significantly more males than the Fly Terminator® Pro. The Trap n' Toss™ caught significantly more females than any other trap except Rescue!® Reusable Fly Trap.

Discussion

The assay developed in this experiment was the key to obtaining the effects of the holes only. By eliminating visual cues and standardizing the odor, the only factor left to effect trap catch was, presumably, the entrance and exit holes.

According to Pickens (1995), bottom-entry traps are the most effective trap design. However, using this assay, there is no difference between traps with a bottom-entry design and a top-entry design. Pickens does not state why bottom-entry traps are superior. One reason may be that house flies tend to fly upward, especially toward light (citation). This assay provides for light to flow in from the top holes, and there is still no significant difference between top and bottom-entry traps, suggesting that neither one is better at trapping than the other.

Pickens (1995) states that the best fly trap design must have a cone with a steep slope (at least 60^{o} to the horizontal). Each of the traps had at least a 60^{o} slope. However,

some outperformed others, with no obviously superior slope. The Trap n' Toss™ had a slope of 61.17° and The Advantage Fly Trap™ had a slope of 75.53°, while the Fly Terminator® Pro had a slope of 90.00°. While this may appear to suggest that the closer to 60° without going under may yield better fly catches, Rescue!® Reusable Fly Trap, which was never significantly different from the best trap, had a slope of 85.07°. This study shows that slope is not an important factor in trap catch.

Pickens (1995) suggests that another way to make a fly trap most effective is to have a large entrance hole (> 25.4 cm) and a small exit hole (0.6 to 1.3 cm in diameter). The Trap n' Toss™, which was never significantly different from the best trap(s), had the largest entrance diameter (14.98 cm), however it had the second largest exit diameter (3.90 cm). The Rescue!® Reusable Fly Trap, which was also never significantly different from the best trap(s), had the smallest exit diameter (1.00 cm per hole), but had the smallest entrance diameter (0.80 cm per hole). The Fly Terminator® Pro, which was never significantly different from the worst trap(s), had the largest exit diameter (5.11 cm) and the fifth largest entrance diameter (5.11 cm). Even when one simplifies the diameter aspect into a matter of ratio, there still is not a discernable pattern in fly catch and entrance/exit size. When this is done, Trap n' Toss™ has the highest ratio (14.75) of entrance to exit area, and Fly Terminator® Pro has the lowest (1.00), but the other consistent trap, the Rescue!® Reusable Fly Trap, has the next to lowest ratio (1.58), despite its good catch numbers.

Color of the entrance may play a role in which traps catch more males, females, or both. In the future, spectrometer readings will be taken of the entrance points of the traps in order to test this hypothesis.

The next step planned for this test is to compare the different commercial designs in simulated field tests inside the established cages outside. This will enable us to determine the effects of other components of the traps such as shape, size, color, etc., that were deliberately excluded with the first assay.

This assay is very promising for future studies because it eliminates visual cues such as size and shape of the trap. For this test, the attractant was common to every trap, making the entrance/exit design the only variable to be tested. By using the same trap, it is conceivable that different attractants may be studied with relative ease and speed in the lab. Also, this assay can be used to test different repellents instead of attractants.

B. Aged Attractants for Baits

Materials and Methods

Everything in this study was similar to the Trap Design Study above, with two exceptions. The first is that the only trap used was Trap n' Toss™, thereby standardizing the trap design, so that different attractants could be tested. The second difference was that the attractant mixture used was the same as above except that it was aged 0, 1, 2, 3, or 4 d.

Data Analysis. A student's t-test was run on the means of the males versus females for each day in SAS 8.01 (SAS Institute 2002).

Data for trap catch were arcsine square root transformed and analyzed using one-way analysis of variance, with catch as the response variable and day as the main effect. Means were separated using a Student Newman-Keuls test. Data were presented, however, as mean percent catch $\pm$ SE. Significant differences were determined at the $P = 0.05$ level. Statistical analysis was completed with SAS 8.01 (SAS Institute 2002).

Table 2. Percentage of flies caught in traps

	Mean % Catch ± SE		
Days	Males	Females	Total
0	51.33 ± 3.49ab	59.33 ± 4.78ab	55.33 ± 3.13abc
1	35.20 ± 5.43b	47.20 ± 4.80b	41.20 ± 4.08c
2	42.00 ± 7.85ab	56.00 ± 7.00ab	49.00 ± 6.65bc
3	60.67 ± 7.04a	65.33 ± 7.06ab	63.00 ± 5.99ab
4	62.00 ± 5.54a	78.00 ± 5.91a	70.00 ± 4.73a

Means within a column followed by the same letter are not significantly different [P = 0.05; Student Newman-Keuls test (SAS Institute, 2001)].

The results of this test are inconclusive and are still being discussed (Table 2). The preliminary thought is that the yeast is feeding on the ammonium ions and producing attractive products such as CO_2. We are planning an experiment that tests the components of the attractant mixture separately to gain a better understanding and to determine if the above hypothesis is true or if there is some other explanation.

B. Fly Attractance to Light

The purpose of this research is to understand how factors in urban environments affect the catch efficacy of house flies by ultra-violet (UV) light traps. The first objective of this study was to develop and standardize a bioassay that overcame location effects associated with light-trap placement.

The second objective was to use that bioassay to examine the effects of fly age on light-trap catch efficacy and examine house fly response time to insect light traps. A catch time for 50% (CT_{50}) was estimated for house flies to determine the approximate time house flies responded to a UV trap. Information from these studies will help us eliminate any bias and determine the proper age range of house flies and length of time for subsequent experiments.

The third objective explored how intensity and quality or spectrum of competing light sources affects house-fly response to UV light traps. For light-intensity experiments, house flies were presented with four intensity levels of competing light. Prior to experimentation, overhead and natural light intensities were surveyed at area food establishments and corroborated with light levels used in tests. For light-quality

experiments, house flies were presented with competing lights with spectral outputs consisting of warm-white fluorescent, daylight fluorescent, cool-white fluorescent, and black-light fluorescent.

The response variable for all tests was the number of flies caught on UV-light trap glue boards at the end of each experiment. One hundred flies, 50 males and 50 females, were used in each test. All light intensity measures were conducted using a HOBO® Light Intensity Logger and all spectral analyses of light were conducted with a USB2000® spectrometer.

Results

For objective one, there were no significant location effects detected among two research buildings, four positions, or box enclosures used (Table 3). For objective two, adult house flies aged 1, 3, and 5 days exhibited significantly greater response towards UV light traps than 7-day old house flies (Table 2). When results were separated by sex, response by adult female house flies remained consistent from 1 to 7 days of age with adult male response decreasing significantly at 7 days of age (Table 4). Response time to UV traps by adult house flies ranged between 2 to 4 hours with 55 to 70 flies caught (Table 5). Female response increased gradually from 1 to 8 hour, but males exhibited a plateau in their response between 2 to 4 hours (Table 5). A probit analysis estimated the CT_{50} for total house-fly response to a UV light trap at approximately 1.72 h (103.2 min) (Table 6). Male house flies were caught by the light traps in significantly less time than females with an estimated CT_{50} of 1.56 h (93.6 min) versus 1.90 h (114 min) respectively (Table 6).

For objective three, a survey showed ambient light-intensity originating from artificial and natural light sources in local food establishments ranged from approximately 27 to 91 Lum/m^2. Significantly fewer adult house flies were caught in UV light traps as the intensity of overhead fluorescent light increased (Table 7). Spectral analyses showed an increase in relative intensity of a blue-green light peak ranging from 480 nm to 510 nm, which corresponds to a sensitivity peak within the house-fly eye (Figs. 1a – d). Results of the light quality studies showed significantly fewer adult male house flies and adult female house flies were caught among all competing light sources when compared against a dark control. When the data were pooled together, overall trap

catch was also significantly lower than the dark control. However, the black light bulbs, which emitted UV, lured significantly more flies than daylight, cool-white, and warm-white bulbs that all emitted a strong peak of blue-green light (Table 8; Figs 2a – d).

Table 3. Mean percent catch of adult house flies among three different locational effects (n = 100).

Building	% Catch ± SE	Position	% Catch ± SE	Box Enclosure	% Catch ± SE
A	63.56 ± 2.41	a_1	63.75 ± 3.79	1	65.62 ± 3.56
		a_2	64.87 ± 3.63	2	65.62 ± 3.71
B	68.00 ± 2.58	b_1	68.37 ± 3.72	3	68.0 ± 3.51
		b_2	68.12 ± 3.71	4	65.87 ± 4.25

Table 4. **Mean percent of UV light trap catch of adult house flies by gender after flies were aged for 1, 3, 5, and 7 d (n = 100).**

	Fly Age (d)			
	1	3	5	7
Gender	**% Mean ± SE**	**% Mean ± SE**	**%Mean ± SE**	**% Mean ± SE**
Male	**40.75 ± 2.33a**	**38.25 ± 1.47a**	**45.5 ± 1.97a**	**22.75 ± 3.22b**
Female	**46.25 ± 2.18**	**48.25 ± 3.75**	**42.5 ± 2.52**	**40.00 ± 1.08**
Total	**87.0 ± 3.21a**	**87.25 ± 3.37a**	**88.0 ± 2.67a**	**62.6 ± 4.21b**

Means within a row followed by the same letter are not significantly different (P = 0.05, Student Newman-Keuls test [SAS Institute, V 8.01, 2001]).

Table 5. Mean percent of UV light-trap catch of adult house flies by gender after flies were exposed to traps for time periods of 1, 2, 4, and 8 h (n = 100).

	Time (h)			
	1	2	4	8
Gender	% Mean ± SE	% Mean ± SE	%Mean ± SE	% Mean ± SE
Male	15.2 ± 1.88a	31.0 ± 1.92b	37.0 ± 2.24b	48.0 ± 1.3c
Female	12.6 ± 1.03a	26.8 ± 3.76b	32.8 ± 3.92c	45.8 ± 1.46a
Total	27.8 ± 2.6a	57.8 ± 5.32b	71.8 ± 6.58c	93.8 ± 2.03d

Means within a row followed by the same letter are not significantly different (P = 0.05, Student Newman-Keuls test [SAS Institute, V 8.01, 2001]).

Table 6. Estimated time to catch of adult house flies by UV light traps.

	n	Slope ± SE	CT_{50} (h)	95% C. I.	X^2	p
Male	250	2.52 ± 0.18	1.56	1.49-1.72	0.34	0.557
Female	250	2.26 ± 0.15	1.90	1.71-2.11	0.52	0.467
Total	500	2.35 ± 0.11	1.72	1.59-1.84	1.03	0.307

Table 7. Mean percent of adult house flies caught in UV light traps at varying intensities of cool-white fluorescent light.

	Light Intensity (Lum/m^2)				
Gender	**0.00**	**27.43**	**51.43**	**91.46**	**125.67**
Male	45.25 ± 0.51a	42.66 ± 1.31ab	41.88 ±1.16ab	40.00 ± 1.49bc	37.00 ± 1.15c
Female	47.00 ± 0.58a	45.00 ± 1.28ab	42.66 ± 0.70bc	40.55 ± 1.37cd	38.22 ±1.35d
Total	92.29 ± 0.85a	87.66 ± 1.45b	84.55 ± 1.20b	80.55 ± 0.97c	75.22 ± 0.92d

Means within a row with the same letter are not significantly different (P=0.05; Student-Newman Keuls [SAS Institute, V 8.01, 2001]).

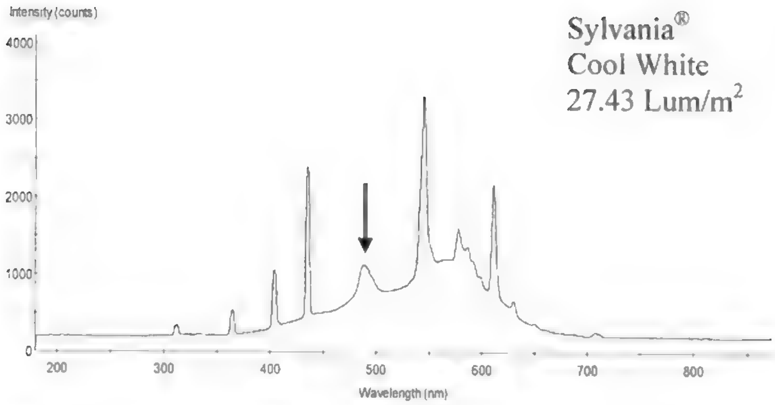
Table 8. Mean percent of adult house flies caught in UV light traps with different sources of competing light.

	Light Bulb Type				
Gender	**Control**	**Warm White**	**Cool White**	**Day Light**	**Black Light**
Male	45.91 ± 0.61a	40.25 ± 1.15b	39.16 ± 1.86b	39.66 ± 0.91b	30.83 ± 1.91c
Female	46.71 ± 0.63a	35.66 ± 2.14b	33.16 ± 2.61b	34.50 ± 1.21b	21.08 ± 2.13c
Total	92.79 ± 0.81a	75.91 ± 2.72b	73.41 ± 1.87b	74.16 ± 1.63b	52.08 ± 3.84c

Means within a row with the same letter are not significantly different (P=0.05; Student-Newman Keuls [SAS Institute, V 8.01, 2001]).

List of Figures

a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200
300
400
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600
700
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Wavelength (nm)
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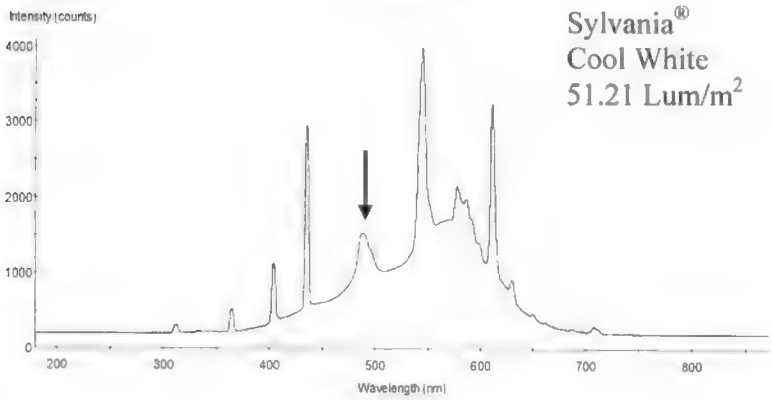
Cool White
27.43 Lum/m²

b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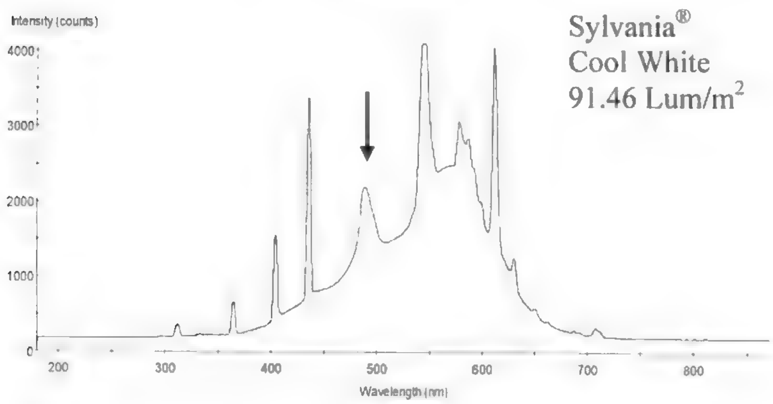
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Wavelength (nm)
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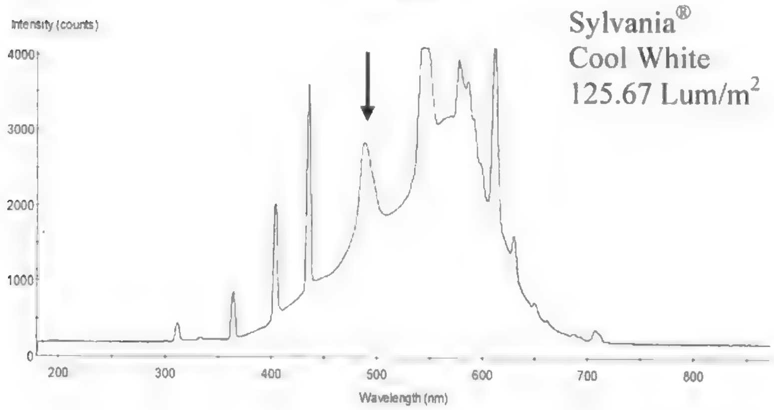
d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Wavelength (nm)
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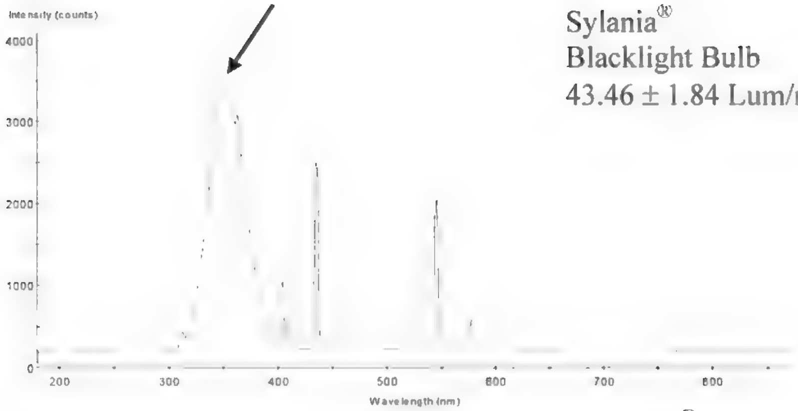
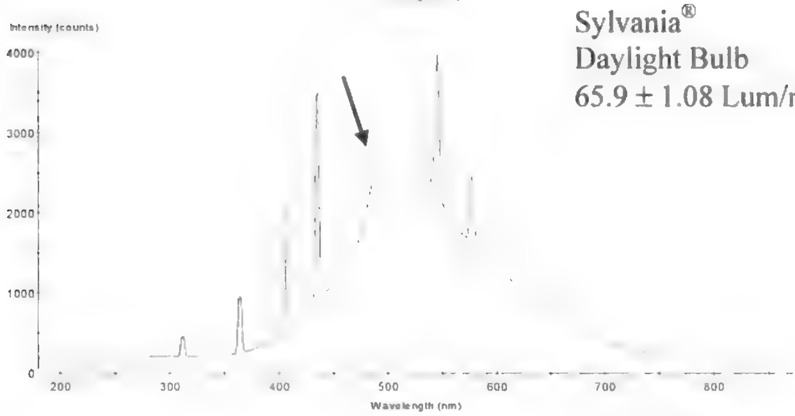
a



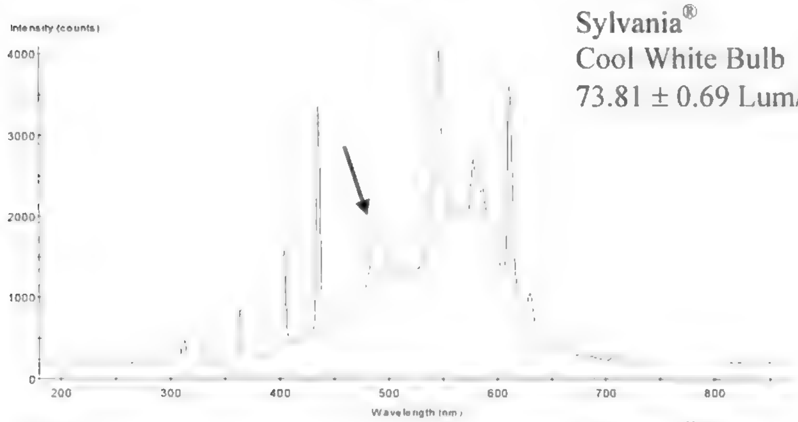
Sylania®
Blacklight Bulb
43.46 ± 1.84 Lum/m^2

b



Sylvania®
Daylight Bulb
65.9 ± 1.08 Lum/m^2

c



Sylvania®
Cool White Bulb
73.81 ± 0.69 Lum/m^2

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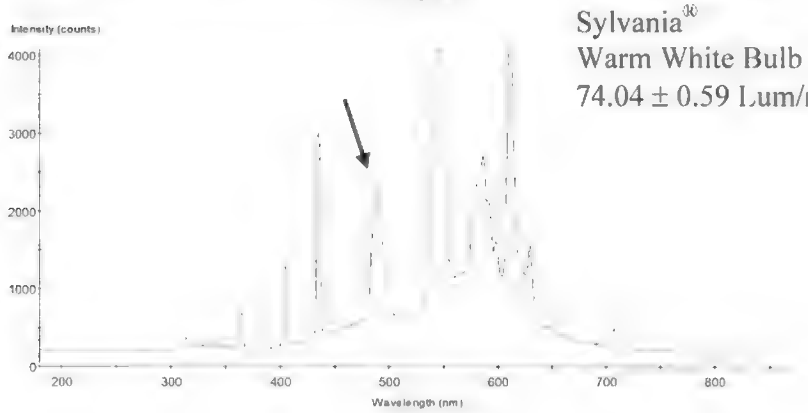

Sylvania®
Warm White Bulb
74.04 ± 0.59 Lum/m^2

6) Residual Insecticide Testing

These studies were conducted on the toxicological effects of current pesticide products and new chemical classes on house flies. Currently, the neonicotinoid chemical group is being tested with the following active ingredients available: Acetamiprid, Clothianidin, Dinotefuran, Imidacloprid, and Thiamethoxam. To test toxicological effects, Petri dish bioassays were conducted at manufacturer's recommended label rates for perimeter application (from 0.06% to 0.10% [AI] concentrations). Residual treatments were applied by pipette to strips of chromatograph paper (20 mm by 70 mm). Each Petri dish had 10 female flies that ranged in age from 1 day to 5 days old. Previous pilot trials have shown that 7 day old flies do not behave in a normal manner (reduced flight activity, mobility, and high mortality in control arenas). Each Petri dish had a solution of 10% sugar water to provide nutrition and energy for the flies. Previous pilot tests have shown that flies need to be provided a food source or 100% mortality will be observed in less than 24 hours without the food source.

Observations were made at 1, 24, and 48 hours. Knockdown (flies still twitching) and mortality (non-responsive to probing) was recorded. Sugar was added to the formulations to attract the flies to the treated strips of chromatograph paper. Formulations were compared with and without sugar and found that the strips with sugar added did yield higher mortalities with best results shown with Thiamethoxam and Clothianidin.

Small PVC cages were constructed to fit inside turkey basting bags. These cages hold 20 strips of chromatograph paper and all strips were treated with pesticides. A 10%

solution of sugar water was provided to the flies as an energy source (soufflé dish). Readings were only taken at 24 and 48 hours with these cages. When compared to the Petri dish bioassays, mortality increased in the PVC cages throughout all the pesticide products tested.

Another study was conducted with the Petri dishes and small cages evaluating potentiation (pesticide formulations consisting of 2 [AI]). In potentiation, the mode of action of one active ingredient enhances the effects of the second active ingredient. The pesticide mixtures consisted of a pyrethroid (Bifenthrin) mixed with one of the neonicotinoids. The concentration of the final mixture was 0.05% pyrethroid + 0.10% neonicotinoid. Initial data from the Petri dishes did not show potentiation statistically. However, data from the small cages did show potentiation with the neonicotinoid Clothianidin. All the other neonicotinoid combinations were not statistically significant (note: Dinotefuran has not been tested).

Future Projects with House Flies and toxicants:

- Evaluate energy consumption in relation to toxicant exposure by looking at molecular sugars in the gut of flies.
- Determine LC50's and LD50's for neonicotinoids. Did not get good data with Acetamiprid during first go around. Other colleagues have had similar results working with Acetamiprid. Waiting on other products to arrive from manufacturers.
- Continue pesticide screenings by using a third bioassay consisting of large (6 by 12 by 6 feet) outside screened cages.
- Evaluate painted surfaces in relation to pesticide treatments

- Determine pesticide resistance in the HTU strain to neonicotinoids in cooperation with Dr. Mike Scharf., a toxicologist with the University of Florida
- Electrophysiology experiments to determine whether potentiation is present in nerve cells of flies in cooperation with Dr. Mike Scharf

A. Insecticide impregnated fly cords

Research on insecticide impregnated fly cords will focus on using fipronil impregnated cord as a control measure. Focus will be based on developing methods that can be directly transferred to forward deployed field locations. Some experimental material was sent with deployed troops to the Middle East during this Summer and Fall. Some of the factors to be evaluated are the type of cord to use (synthetic, natural), thickness of the cord, color of the cord, placement of cord (vertical, horizontal, etc.), the addition of sugar to the cord (increase likelihood of ingestion of pesticide), and effectiveness of cord residual over time. Testing will be done in laboratory and field settings. Additional testing may be incorporated to increase effectiveness of final product, such as the construction of a trap combination of fiberglass and cord.

7) Contact toxicity testing

Contact toxicity testing will be done in a wind tunnel system. The wind tunnel system initially described by Mount et al. (1976) and redesigned by Dr. E.J. Gerberg and is an assembled and tested system for evaluating aerosol insecticides against Diptera such as mosquitoes and flies (Figues 1 & 2). The wind tunnel consists of a cylindrical tube six inches in diameter through which a column of air is moving at 4mph. Atomization of the

candidate insecticidal aerosol, which will be dissolved in acetone, takes place in the upwind portion of the tunnel and is atomized at 1.5psi. The aerosol is then transferred through the movement of the air at the downwind portion of the wind tunnel where caged, female populations of mosquitoes/flies are exposed. The population size will vary from 20-30 females. The insect age will vary from 2-4 days old.

The populations of mosquitoes/flies will be exposed to different concentrations of the candidate insecticide. In between each test series the populations will be treated with plain acetone as a control check. After treatment the populations will be transferred in untreated cages and cotton pads soaked in sugar-water will be placed on the screen of the cages to sustain the insects for a 24hrs period. After this 24hrs period mortality will be determined. The dosage/mortality data will be used to determine the LD50 and LD90 of each insecticidal candidate. The equipment was recently obtained and is in the process of being setting and will be operational this fall once the building is complete.

YEAR 1 (2004-2005) REPORTABLE OUTCOMES

- The following graduate students were hired and are researching aspects of flies and insecticides for deployed forces:
  Matt Aubuchon, Ph.D. candidate
  Lt. Ricky Vazquez (U.S. Army Reserve), Ph.D. candidate
  Alexandra Chaskopoulou, M.S. candidate
  Ryan Welch, M.S. candidate
  HM1 Jeff Hertz (U.S. Navy), M.S.candidate
  Kim Fererro, M.S. candidate
  Enlisted assistance of Dr. David Williams as a research advisor

- A field strain of house flies was established in our laboratory and is being mass produced for testing. Ammonia production by fly larvae is being investigated to improve rearing conditions.

- Facilities are now available for testing insecticides on flies. Screened cages were purchased and set up for outdoor testing of insecticide formulations. A wind tunnel was acquired for testing toxicity of contact insecticides. University of Florida agreed to build a room to house the wind tunnel

- Requests were disseminated for insecticides, insecticide formulations, and technologies among industry contacts. Neonictotinoids, Pyrethriods, Phenylpyrazoles, Oxadiazines, and Organophosphates were submitted by manufacturers for evaluation. Manufacturers who have submitted or are planning on submitting compounds for testing are FMC, Syngenta, DowAgroSciences, Wellmark/Zoecon, Dupont, BASF, Bayer, Sumitomo/MGK, and Whitmire.

- Primary bait toxicity testing was initiated on the neonicotinoid insecticides. Because these are primarily water soluble, water/sugar based insecticide treatments determined oral toxicity using 3 assays: (a) Petri dish assay, (b) small cage assay, and (c) field cage assay. Initiated research on (a) traps and (b) attractants.

- Primary residual surface testing was initiated. Dose-dependent mortalities of house flies to insecticide residues were determined. Evaluation of pyrethroid/neonictotinoid combinations was conducted.

- Insecticide residues on fly cords were preliminarily evaluated with pyrethoid and phenylpyrazole insecticides in a small field study with deployed forces in the Middle East. Research on the preference of flies for color/gauge of yarn will be developed. Dose-dependent mortality of flies exposed to treated fly cord will be investigated.

CONCLUSIONS

During Year 1, we have addressed all the tasks and milestones in the Statement of Work for the grant. We have hired six graduate students to research insecticides and flies. Two of the students are currently in the military. Facilities were established for rearing flies at the University of Florida. A field strain of house flies has been established and is being mass produced.

Facilities for testing insecticides on flies is being built and will be completed before Thanksgiving. Screened cages were purchased and were set up for testing. A wind tunnel was acquired for testing toxicity of contact insecticides.

We contacted industry and notified them of our ability to test and evaluate new insecticides and technologies. Insecticides submitted were pyrethoids, neonicotinoids, phenylpyrazoles, oxadiazines, and organophosphates. Laboratory bait toxicity and attractant were initiated and followed by field cage evaluations. Preliminary residual surface testing was initiated, as was preliminary studies on the use of fly cords. A field test with deployed forces was conducted.

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APPENDICES

Biographical Sketches
Pictures of wind tunnel

Philip G. Koehler, Department of Entomology & Nematology, University of Florida, Gainesville, FL 32611
352-392-2484, FAX 352-846-1500, pgk@ufl.edu

Educational Background

Institution	Location	Program	Date	Degree
Cornell University	Ithaca, NY	Entomology	1972	Ph.D.
Catawba College	Salisbury, NC	Biology	1969	B.A.

Professional Experience

Position	Institution	Department	Dates
Margie & Dempsey Sapp Endowed Professor of Urban Entomology	Univ. of Florida	Entomology & Nematology	1999-present
Professor of Entomology	Univ. of Florida	Entomology & Nematology	1984-1999
Associate Professor of Entomology	Univ. of. Florida	Entomology & Nematology	1979-1984
Assistant Professor of Entomology	Univ. of Florida	Entomology & Nematology	1975-1979
Medical Entomologist, Lieutenant	U. S. Navy	Medical Service Corps	1972-1975

Development of New Technologies for Urban & Medical Pest Management
Cockroaches, fleas, ants, mosquitoes, and termites are common pest problems in urban and military settings. These and other pests must be detected and controlled. During the past 30 years, I have been involved with the development of new technologies to manage insect pests, insect growth regulators (synthesized insect hormones) for control of cockroaches, flies, and fleas, and new chemistries for control of insect pests. I have also been involved in evaluation of repellents for mosquitoes.

Teaching responsibilities
ENY 4660 & ENY 6665, Medical and Veterinary Entomology
ENY 5222 & ENY 3222, Biology & Identification of Urban Pests
ENY 5224 & ENY 3224, Principles of Urban Pest Management
ENY 4228, Urban Pesticide Application

Selected Grants and Contracts (Grants during last 7 years: $1,962,813)
EPA. $50,000.00. Develop Model School IPM Program in Florida. 1997.
DOD-SERDP. $13,000.00. Pesticide Reduction Through Precision Targeting. 1997.
EPA. $11,000.00. Develop and Demonstrate Reduced Risk Technologies. 1997.
Grants from Chemical Industry. $51,000.00. Cockroach & termite Research. 1998.
EPA. $40,000.00. School IPM Web Site Development. 1998.
FL Dept. of Educ. $25,000.00. Evaluation of importance of cockroaches, mites and pesticides to children's asthma. 1998.
USDA-SCA. $55,000.00. Develop and demonstrate demonstrate reduced risk technologies. 1998
US Army. $750,000. Develop new technologies for fly control. 2004.

Publications (Last 7 years)
Books: 1 Refereed Papers: 34
Chapters in Books: 8 Miscellaneous Papers: 201

Honors and Accomplishments
Graduate Teacher/Advisor of the Year Award, University of Florida, 1999-2000
Florida Entomological Society Award for Team Research, 1999
Blue Key Distinguished Faculty Award, University of Florida, 1997
Professorial Excellence Award, University of Florida, 1996

Curriculum Vitae

Richard S. Patterson, Department of Entomology & Nematology, University of Florida, Gainesville, Fl 32611 352-392-2485, FAX 352-846-1500 rspatt@ufl.edu

Educational Background

Institution	Location	Program	Date	Degree
Cornell University	Ithaca, NY	Entomology	1962	Ph.D.
U. of Massachusetts	Amherst, Ma	Entomology	1955	M.S.
U. of Massachusetts	Amherst, Ma	Entomology	1954	B.S.

Professional Experience

Position	Institution	Department/Field	Date
Professor (courtesy)	U. of Florida	Entomology & Nematology	1966 - present
Consultant	Patterson Research	Urban/Medical Entomology	1995 - present
Entomologist/ RL	USDA/ ARS	Mosquitoes, Flies, Ants, Cockroaches etc	1966 - 1995
Entomologist*	WHO	Malaria, yellow Fever, Filariasis	1970 - 1972
Entomologist/Director	Florida	Midge Research	1962 - 1966
Entomologist	US Army	Medical Service Corp	1955 - 1957

Research and Work Experience:

Dr. Patterson is considered by his peers as a leader in the field of biological and biorational control of medical & urban arthropod pests especially mosquitoes, flies, cockroaches, ants and fleas. His research has been reported in Time, Newsweek, U.S. News and World Report, Smithsonian and Natural History magazines as well as reported in many of the leading newspapers like the Wall Street Journal, New York Times, Washington Post etc. His research was featured on the Today Show, Night line Show , Smithsonian, PBS and Discovery TV. He has done over 100 consultant contracts for foreign governments and multi-national chemical companies. Most of his current research is on chemical and technology evaluation for the control of urban/medical arthropods in the USA and overseas

Publications

Dr. Patterson has authored or co authored over 250 scientific papers in refereed scientific journals, edited three books and holds 10 patents

Honors and Awards:

Dr Patterson has been recognized 25 times for his research achievements and ability by his peers,. and the federal government. In 1991 he was selected as USDA-ARS scientist of the year. He received the USDA Superior Service Award Twice. He was very active and held various offices in several professional Societies

* on loan from USDA-ARS to WHO

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Education:
1969 University of Florida; PhD
1967 University of Louisiana-Lafayette; MS
1964 University of Louisiana-Lafayette; BS

Dr. David Williams is a courtesy faculty member in the Department of Entomology-Nematology, University of Florida. He retired January, 2004 as the Research Leader of the Imported Fire Ant and Household Insects Research Unit at the USDA, Agricultural Research Service, Center for Medical, Agriculture and Veterinary Entomology in Gainesville, Florida. He was with the USDA, ARS for 29 years and conducted research on the biology and control of the imported fire ant for over 26 years and on stable flies for 3 years. His research led to the development of most of the commercially available chemical baits used for the control of the imported fire ant in the U.S. and to the development of the "Williams trap", still in use today for monitoring stable flies and other biting flies. He is a co-holder of 6 patents, obtained over $7 million in grants and published over 175 scientific publications, 10 book chapters, 260 abstracts, and given over 300 formal presentations. He is an advisor and consultant to industry, state, federal, and foreign government agencies on the control of fire ants, other pest ants, and stable fly biology and ecology. He is a member of the Science Advisory Panel on the imported fire ant for the State of California and has served as an expert witness and consultant in litigation involving fire ants. He is a member of several scientific societies, is a Past President of the Florida Entomology Society and Past President of the Southeastern Branch of the Entomological Society of America. He has received several awards from professional societies and from the USDA. Dr. Williams is listed in Who's Who in American Men and Women of Science, Who's Who in American Education, Who's Who in Science and Engineering, and Who's Who in the South and Southeast. He has been listed in over 70 newspaper articles, over 45 magazines and books, been in 12 radio interviews and appeared in 22 television and film interviews.

MATTHEW D. AUBUCHON Resume
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Gainesville, FL 32611-0620
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EXPERIENCE

- **Graduate Research & Teaching Assistantship**, Entomology and Nematology Department; University of Florida. 2001-present.
- **Graduate Research & Teaching Assistantship**, Department of Entomology and Plant Pathology; Auburn University, 1998-2001.
- **Laboratory Technician,** Department of Entomology & Plant Pathology, Auburn University. 1997.
- **Aquatic Applicator**, Weed Patrol Inc., Elkhart, IN. May-Aug. 1997; 1996; & 1995.
- **Teaching Assistant,** E300-Environmental Science, Indiana University. 1997.
- **Research Assistant,** Center for Policy Alternatives, Washington, DC. 1995.

EDUCATION

- **University of Florida. PhD. Candidate in Entomology.** Expected graduation May 2006.
- **Auburn University. M.S., 2001**; Major – Entomology.
- **Indiana University. B.S., 1996**; Major - Environmental Science and Policy.

PUBLICATIONS (refereed)

- One manuscript submitted to Journal of Economic Entomology
- Three manuscripts are currently in preparation for entomological journals

PRESENTATIONS at SCIENTIFIC CONFERENCES

Prepared 15 research presentations for annual meetings of the following organizations:

- Florida Entomological Society (FES)
- Entomological Society of America (ESA)
- World Health Organization (WHO)

HONORS, AWARDS, & TRAVEL GRANTS

- **Travel Grants**. Twelve separate grants from multiple sources supported travel to professional meetings between 2000-2005.
- **Florida Entomological Society Student Scholarship.** 2004; 2003.
- **National Scholars Award of Achievement**. 2003
- **Academic Acheivement Award.** Certified Operators of Southwest Florida, 2002; $500.
- **Pi Chi Omega Scholarship**, 2002.

- **Auburn University Graduate Dean's Award for Excellence**, Auburn University Graduate School, 2001.
- **Kirby L. Hays Award,** Southeastern Branch of the Entomological Society of America, 2000.
- **National Geographic Society & British Cartographic Society Student Award**, 2000.
- **Outstanding M.S. Graduate Student Award**, 2000.
- **F.S. Arant Entomology Scholarship**, Auburn University Department of Entomology and Plant Pathology, 1998-99.
- **Graduated with Honors.** Indiana University, B.S., 1996.

EXTENSION PRESENTATIONS

- **Extension Outreach.** Organized approximately 30 presentations targeted to needs of technicians, pest control operators, and Master Gardeners between 2001-2005.
- **Education Outreach:** Organized approximately 20 presentations for local schools between 1999 – 2003.

JEFFREY C. HERTZ

OBJECTIVE

Provide research in the field of Entomology that can be utilized and proved beneficial to enhance force protection to forward deployed military units.

SUMMARY OF QUALIFICATIONS

- Ten years of experience as a Naval Hospital Corpsman.
- Five years experience as a Medical Laboratory Technician, ASCP.
- Trusted, awarded, and documented leader who has performed exceptional in a variety of the military's most stressful positions.
- Top Secret Clearance granted in April 2003

WORK EXPERIENCE

November 1994 – Present, United States Navy

Advanced Medical Technician (5 Years Experience)

Graduate Student, University of Florida, Department of Entomology

- Research focused on controlling *Musca domestica* in military forward deployed units utilizing old techniques with new technologies.

Office of Attending Physician, U.S. Congress, Washington, D.C.

- Provided unsurpassed care and laboratory services to the Supreme Court Justices, Members and staff of the U.S. Congress in a highly critical and demanding environment.
- Essential to the Continuity of Government planning, preparations, and operations for Capitol Hill, including Inaugurations, State of the Union addresses, and other high profile events.

Navy Environmental & Preventive Medicine Unit #5, San Diego, CA

- Key player in implementing the Navy's first level B laboratory to participate in the Centers for Disease Control Laboratory Response Network.
- Performed over 700 assays to produce data on bacterial strain relationships that provided predictive information on the spread of virulent strains of bacteria carried in the general populace.

Hospital Corpsman (10 Years of Experience)

2D Medical Battalion, 2D Field Service Support Group, Camp Lejeune, NC

- Led specialized medical teams and acted as the sole medical provider for numerous missions and exercises in Europe, Africa, and Central America.

Naval Medical Center, Portsmouth, VA

- Shift supervisor to all enlisted staff in the 12 bed Intensive Care Unit.

Alexandra Chaskopoulou
Department of Entomology and Nematology
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andahask@ufl.edu

OBJECTIVE

Position as a Graduate Research Assistant testing primary contact toxicity of insecticidal aerosols on mosquito and fly populations using a specially modified wind tunnel

EDUCATION

- Master of Science in Entomology, University of Florida, Anticipated Graduation Date: May 2007
  Major Professor: Dr. Phil Koehler
- Bachelor of Science in Entomology, University of Florida, July 2005, GPA: 3.89/4.0
  Advisor: Dr. Phil Koehler
- Minor in Biology, Andrews University of Michigan, May 2004, GPA: 3.85/4.0
  Advisor: Dr. Bill Chobotar

EMPLOYMENT HISTORY

- Mosquito surveillance position, employed by Air Applications Company in Greece, May-August 2002
- Graduate Assistant Position, employed by the Urban Entomology Laboratory of University of Florida, Department of Entomology and Nematology, August 2005- May 2007
  Position responsibilities:
  Maintenance of mosquito colonies
  Testing toxicity of low molecular pesticides on mosquito populations
  Extension talks for pest management professionals

HONORS AND SCHOLARSHIPS

- Urban Entomology Scholarship, awarded by the Department of Entomology and Nematology at University of Florida, September 2004 - May 2005
- Steinmetz Scholarship, awarded by the Department of Entomology and Nematology, at University of Florida, September 2005- August 2006

Curriculum Vitae

Ryan M. Welch
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(352) 392-2326 ryanw76@ufl.edu
Home 260 NW 44th St., Gainesville, FL 32607

OBJECTIVE:

Career in entomology

ACADEMIC PREPARATION:

M. S. in Entomology, University of Florida, Gainesville, FL, Anticipated Graduation Date, May 2005
Advisor: Dr. Phil Koehler.

B. S. in Entomology, Cum Laude, University of Florida, Gainesville, FL, 2004.
Advisor: Dr. Donald Hall.

B. S. in Politcal Science, Cum Laude, University of Florida, Gainesville, FL, 2004.
Advisor: Dr. David Hedge.

RESEARCH SKILLS:

-Laboratory evaluation of fly traps and attractants
- Data management
- Survey and evaluation of research techniques

PROFESSIONAL EXPERIENCE:

Graduate Research Assistant, 2004-2005

Department of Entomology and Nematology, University of Florida, Gainesville
-Laboratory evaluations of different market fly traps and attractants for *Musca domestica*
-Extension talks and training for pest management professionals
-Maintenance of laboratory insect colonies

Graduate Teaching Assistant, 2005

Department of Entomology and Nematology, University of Florida, Gainesville
-Principles of Entomology Lab

PUBLICATIONS:

-D. A. Melius, R. Welch, L. A. NcHerne, J. A. Smith, and P. G. Koehler. Biting Stinging and Bloodsucking Arthropods. 2005. IFAS Extension publication number SP 358. University of Florida Cooperative Extension Service, University of Florida, Gainesville, Fl

PAPERS PRESENTED AT CONFERENCES:

-*Laboratory Evaluation of Fly Attraction and Trapping Using* Musca domestica. Presented at the 2005 Southeast Pest Management Conference, Gainesville, Fl
- *Evaluation of Fly Attraction and Trapping Using* Musca domestica. Presented at the 2005 Florida Entomological Society Annual Meeting, Sannibel, Fl
-*Evalutation of Fly Traps and Attractants Using* Musca domestica. To be presented at the 2005 Entomological Society of America Meeting, Ft. Lauderdale, Fl

CURRENT RESEARCH INTERESTS:

Current designs for fly traps and improvements to be made
Properties of attractant compounds
Fly attraction to different compounds

PROFESSIONAL MEMBERSHIPS:

-Entomological Society of America
-Florida Entomological Society
-Urban Entomological Society
-Entomology and Nematology Student Organization
-Golden Key Honors Society

HONORS AND AWARDS:

Florida Bright Futures Scholarship (100%), Gainesville, FL, 2000-2004.
John T. & Myrtle Beth Creighton Scholarship, Gainesville, FL, 2002-2003.
Lawrence A. Hetrick Scholarship, Gainesville, FL, 2003-2004.

Ricardo J. Vazquez Curriculum Vitae July 2005

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rickyv@ufl.edu

Education

August 2004-Present. University of Florida Gainesville, FL
Ph.D. Entomology. Specialization in medical and veterinary entomology.
Graduate advisor: Dr. Philip G. Koehler

August 2004. University of Florida Gainesville, FL
M.S. Entomology. Specialization in biological control.
Graduate advisor: Dr. Sanford Porter

December 2001. University of Florida Gainesville, FL
B.S. Entomology. Specialization in urban pest management
Academic advisor: Dr. Philip G. Koehler

April 2006 St. Johns River Community College Palatka, FL
AA, Cum Laude

Experience

December 2004 - Present Commissioned Officer, U.S. Army Reserves
Medical Entomologist, Medical Service Corps.
Commander 342nd Medical Detachment in Gainesville, FL

February 2002- August 2002 Biological Science Technician
USDA-ARS CMAVE Gainesville, FL

June 2000- April 2001 North Florida Regional Medical Center
Emergency Room Patient Care Technician

Figure 1—Wind tunnel system for testing aerosol insecticides against mosquitoes and flies. Cylindrical tube is closed.

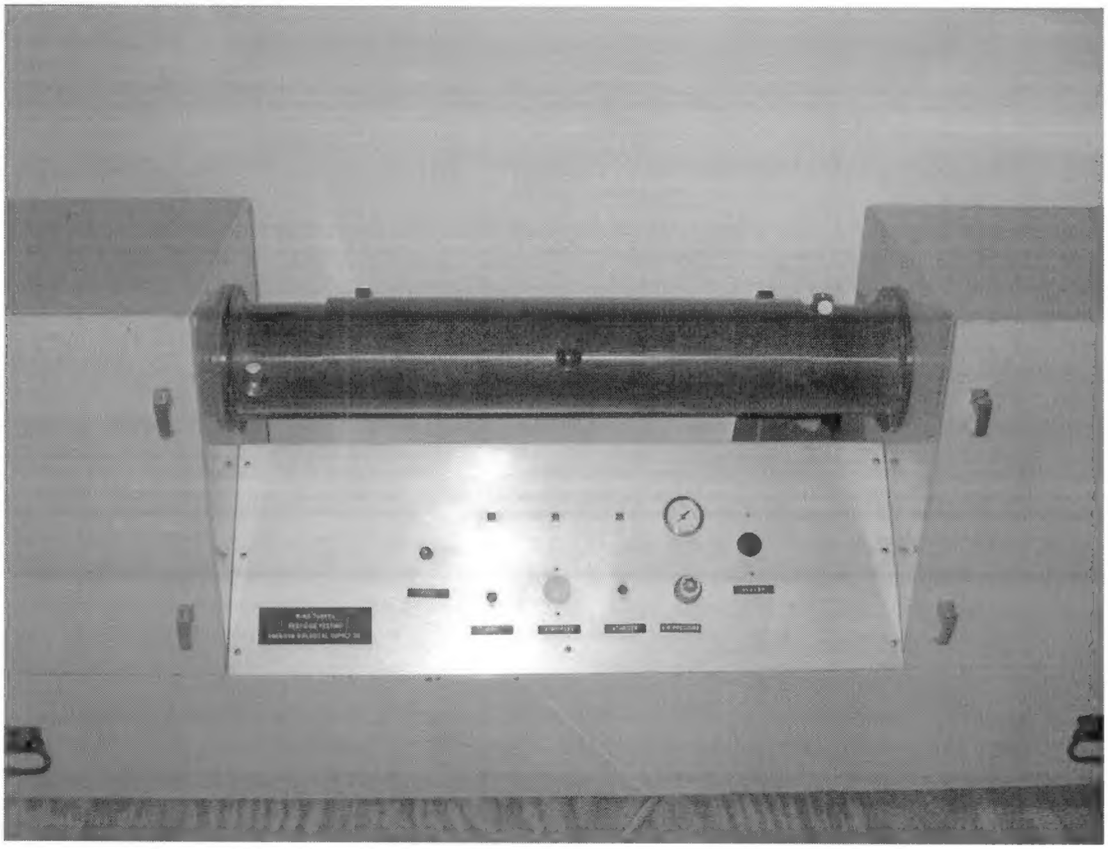

Figure 2—Wind tunnel system for testing aerosol insecticides against mosquitoes and flies. Cylindrical tube is open.